

An economic impact assessment of Maine's party/charter service industry using the IMPLAN system: methods and procedures

I) Define impact objectives

In this example, the objective was to assess the relative economic contribution of the for-hire marine fishing industry to Maine's economy. Party and charter angler expenditures were analyzed separately for Maine residents and nonresidents. Spending by nonresident anglers is generally considered new income for the state, whereas it is often argued that expenditures by resident anglers simply redistributes state income (see Storey and Allen 1993). Regional I/O models, such as IMPLAN measure the net effect of spending on regional economic activity. An increase in nonresident angler spending stimulates an overall net increase in total sales, income and employment. However, an increase in resident angler spending would likely be offset by an equal reduction in other leisure-related industry expenditures within the state, resulting in the same net economic impact. This is the most common reason given for including only nonresident recreation spending in regional I/O models. Clearly, however, resident spending supports jobs in specific industries that would not otherwise exist, although at the "expense" of other sectors. Moreover, resident impacts would be lost if these anglers fished in other states.

Finally, jobs, sales and income depend on a state's ability to provide quality for-hire fishing trips to all anglers. Accordingly, resident and nonresident impacts as well as the total impacts of all anglers are delineated in this study. Public officials and fishery managers concerned with the appropriate interpretation and use of I/O assessments are nonetheless encouraged to bear in mind the distinctions between resident and nonresident impacts. estimate the impacts of nonresident and resident party/charter angler expenditures on Maine's economy. Thus, two impact assessments were estimated: one from resident expenditures and one from nonresident expenditures.

II) Generate expenditure estimates (final demand categories)

Expenditure categories must be delineated and estimated before impact assessments are generated. Expenditures by party and charter boat anglers in Maine were obtained from two independent sources: (1) the 1994 Northeast Region economic add-on to the National Marine Fisheries Service's (NMFS) Marine Recreational Fishery Statistics Survey (MRFSS) and (2) the U.S. Fish and Wildlife Service's 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (National Survey). Although the MRFSS survey did not focus specifically on fishing-related expenditures, respondents were asked to report their share of trip-related expenditures for lodging and party/charter fees. A total of 268 surveys were fully completed by anglers fishing from party/charter boats in Maine; nonresidents comprised 68 percent of the total. Estimates of food and beverage expenditures were derived from the 1996 National Survey. Saltwater fishing information collected in the National Survey focused on the participation, characteristics and expenditures of U.S. residents 16 years of age and older. As part of the survey, anglers were asked to report for each state they fished in, their share of food, drink and refreshment expenditures on saltwater fishing trips.

Trip-related angler expenditure data collected from the 1996 National Survey and the 1994 MRFSS economic add-on were used to estimate the average total outlay by party/charter

fishermen in Maine. In order to project trip-related expenses for all party/charter fishing days in Maine during 1996, it was necessary to generate average daily in-state resident and nonresident expenditure estimates per party/charter participant.

Average daily food and drink expenditure per participant was calculated by dividing the 1996 National Survey's estimate of total food and drink expenditures of all anglers in Maine by the MRFSS estimate of annual number of fishing days. A lack of available information on state of residence and mode of fishing precluded the ability to distinguish resident and nonresident party/charter anglers from all other anglers (i.e., resident and nonresident shore and private/rental boat anglers). The food and drink expenditure estimate was subdivided into restaurant meals and groceries according to proportions developed by the Sport Fishing Institute (currently known as the ASA; Fedler, personal communication).

The average daily lodging cost per participant was computed from the MRFSS 1994 economic add-on survey. Party/charter anglers in the survey reported making two types of trips: day trips and multi-day overnight trips. Overnight anglers were asked to report the length and total lodging cost for the trip while day trip anglers were assumed to incur no lodging costs. Regardless, both trip types were included in the average cost calculation by adding the total number of day fishing trips to the total number of days spent on overnight trips. The average daily lodging cost per participant was then calculated by dividing the aggregated estimate of days across both trip types into total lodging expenses for residents and nonresidents. Observations that exceeded 400 miles one-way were dropped.

In-state travel expenses were determined with data obtained from the MRFSS 1994 economic add-on survey. Roundtrip mileage from an individual's home to the intercepted fishing site, estimated from PCMILER software (ALK Associates, Inc. 1995), was multiplied by 8.0 cents per mile (American Automobile Association estimate of the average per mile cost of operating a car in 1996) to arrive at a total travel expense for each respondent. In-state travel expenses by nonresidents were assumed to be half of the total. In addition, since information pertaining to anglers traveling together was unavailable it was assumed that each angler paid the full cost of travel.

The last angler trip-related expense calculated for this study was passenger fees. Average resident and nonresident estimates were also generated with data obtained from the MRFSS 1994 economic add-on survey.

Table 1 presents average daily 1996 trip-related expenditures per participant for the five expense categories just described. Assuming similar party/charter fishing behavior in 1996 as in 1994, categories estimated with data obtained from the MRFSS 1994 economic add-on were adjusted for inflation to their 1996 equivalent using IMPLAN deflators (derived from the Bureau of Labor Statistics Growth Model). As expected, the total average nonresident in-state expenditure was substantially higher than the resident average. In particular, lodging and passenger fees constituted the majority of the difference. Nonresidents tended to travel further and, thus, were more likely to require overnight lodging. The difference in passenger fees, on the other hand, is not as easily explained. Nonresidents may have taken more trips that specifically targeted gamefish. These types of chartered trips are generally more expensive than trips that target bottomfish. Another possibility is that nonresident anglers simply don't have the time or the local knowledge that residents have to compare prices. The remaining expenditure category estimates (groceries, meals and travel by private auto) were virtually identical across participant type. These similarities, however, reflect the aforementioned data limitations rather than uniform

spending behavior.

The average daily trip-related expenditures per participant in Table 1 were multiplied by MRFSS estimates of nonresident and resident total party/charter fishing days in Maine during 1996 to derive total expense estimates (Table 2). Estimates from the MRFSS survey indicate that marine party and charter anglers fished approximately 18.4 thousand days in Maine during 1996. Out-of-state residents represented 70 percent of total days. Because nonresidents spent comparatively more days party and charter fishing in Maine during 1996 and incurred higher daily costs, their total in-state trip-related expenditures were 8 times that of Maine residents. As previously mentioned, nonresident expenditures are generally considered new money for the state. Thus, the state-level impacts of nonresident expenditures are of primary importance in the EIA to follow.

Party and charter boat angler expenditures comprise only the direct expenditures associated with for-hire fishing trips. As previously mentioned, for-hire businesses and other affected industries (e.g., lodging establishments, restaurants, grocery stores, etc.) also purchase goods and services and may hire labor in response to angler demands. These activities impact Maine's economy through the mix of inputs purchased and the profits that are generated. While the IMPLAN software system provides detailed purchasing information for 528 industrial sectors, each sectoral production function (i.e., the mix of inputs purchased to produce one dollar of output) characterizes aggregate purchasing activity of many businesses. In other words, IMPLAN's production functions represent weighted averages of individual businesses contained within a given industrial sector. Thus, businesses that purchase the most inputs have the greatest influence on a sector's aggregate production function. For sectors with related but clearly distinguishable establishments, IMPLAN production functions will not accurately portray the purchasing behavior of each business. For example, IMPLAN combines for-hire business activity into an all encompassing Amusement and Recreation Services sector. The production function, resulting trade flows and marketing margins reflect aggregate economic activity across numerous amusement and entertainment businesses. For this reason, primary cost data were collected by two methods to characterize the actual purchasing activities of for-hire businesses in Maine during 1996. First, a telephone survey, was conducted during the 1996 fishing year (summer/fall) to acquire variable, trip cost information (e.g., fuel, oil, bait) from party and charter boat owners. This survey was run in conjunction with the annual party/charter effort telephone survey administered by the Maine Department of Marine Resources (MDMR). Owners were drawn from a list of 39 party/charter vessels provided by the MDMR and four were randomly contacted per week about the previous week's trips. The MDMR believed the list was representative and encompassed most, if not all, of the charter and party boats operating in Maine during the 1996 fishing season. In addition, a mail survey was designed to collect fixed cost information (e.g., loans, insurance, wages, maintenance, etc.) and was conducted after the completion of the 1996 fishing season. The survey was mailed to all 39 owners, followed by three reminder mailings and additional surveys to those who had not responded. Of the 39 surveys mailed, 28 were returned and completed resulting in a response rate of 69 percent.

Primary survey data were used to characterize the types of expenses for-hire vessel owners in Maine encountered as part of their business in 1996. A linear production function representing average annual operating expenditures as a function of annual sales was estimated and will be incorporated into the IMPLAN system in step 4. Table 3 reports the production function and the corresponding IMPLAN sectors used to apportion each expenditure (more on

this in step 4).

III) Build your study area within IMPLAN

The impact area was the state of Maine. Thus, after you load the Maine data (from IMPLAN) and the IMPLAN software click on “new model” and select the Maine data file. Click go, and IMPLAN will build your study area, i.e., it will create region specific I/O structural matrices.

IV) Edit the region data to conform to your local knowledge

This is the step where you will aggregate/disaggregate sectors, edit production functions (i.e., absorption coefficients), margins, regional purchase coefficients, etc. **IMPORTANT** - all edits need to be made before a model’s multipliers are generated. Any time a change is made, IMPLAN will let you know that the study area needs to be regenerated to account for the changes.

The first step is to associate the appropriate IMPLAN sectors to the angler expenditures. In other words, we need to identify IMPLAN sectors where we will be (during the impact assessment step) multiplying a sectors multiplier by total angler expenditures. The IMPLAN user’s guide contains a Table that delineates the IMPLAN sectoring scheme and the associated SIC codes. Find the appropriate SIC code to apply the expenditure to and match that SIC code to an IMPLAN sector using the Table in the user’s guide. An SIC search can be done at <http://www.osha.gov/oshstats/sicser.html>. This WEB page allows the user to search the 1987 version SIC manual by keyword, to access descriptive information for a specified 4-digit SIC, and to examine the manual structure. Table 4 shows the description of economic sectors used in the Maine party/charter IMPLAN model.

Three out of the five expenditure categories (lodging, eating & drinking places, and travel expenditures) were applied directly to the default IMPLAN sectors shown in Table 4. The other two expenditure categories (P/C fee and food & drink purchases) were applied to modified IMPLAN sectors. First, Food & drink purchases likely contains expenditures for sandwiches, chips, snacks, soda and alcohol. After searching the SIC codes, I found that IMPLAN sector 450 (Food Stores) contains convenience store and supermarket purchases which entail expenses made on sandwiches, chips and soda, but not alcohol. IMPLAN sector 455 (Miscellaneous Retail) contains retail expenditure estimates of alcohol purchases. Because I did not have data to distinguish between alcohol and the other expenses, I was forced to aggregate sector 450 and 455 into a new sector which I called food & drink purchases. See user’s guide for issues/problems associated with aggregating sectors.

Aggregating two existing IMPLAN sectors is quite easy. First, click on Model on the menu bar and then click on aggregate. Scroll through the IMPLAN sectors in the lower left portion of your screen and select the sectors you wish to aggregate. Click on “new” and type in a new name for your aggregated sector. Finally, click on “aggregate” and IMPLAN will aggregate those two sectors into a new sector with new production functions, trade margins, regional purchase coefficients, output, byproducts, employment, etc. Note: the old sectors are removed during the aggregation process. **IMPORTANT:** all aggregation must be done at the same time. IMPLAN will only allow you to aggregate sectors in your study area data once.

Disaggregating an existing IMPLAN sector into two or more sectors is time consuming, and somewhat confusing, but was necessary to properly characterize the party/charter service industry in the I/O model. In this example, my objective was to subtract out the party/charter business activity associated with IMPLAN sector 488 (Amusement and Recreation Services) and move this information to a new sector (which I called Party/Charter Fishing). Initially, several somewhat “hokey” steps are required to complete this task. The following section outlines the steps for splitting one implan sector into two or more. First, click “edit,” “region data” and select the “industry” tab. Find a sector that does not exist (i.e., in Maine there are 162 sectors to choose from - I chose Oil bearing crops). Add annual output (sales) data from the party/charter service industry to Oil bearing crops and then add your available employment and value added data. This information came from our Maine survey of party/charter owners and operators. Next, remove the information you added to Oil bearing crops from Amusement and Recreation Services. Close the edit screen. Click “Model” from the menu tab, select “aggregate”. Create an aggregated sector with Oil bearing crops and some other sector that is not represented in your study area and give it a new name (I called it Party/Charter Fishing). This is the only way I know of to create a new sector in the I/O model. At this point, you have a new sector called Party/Charter Fishing with the correct output, employment and value-added information. However, there are several more steps required. Click “Construct Model,” “Advanced” and IMPLAN will run through the production function. After IMPLAN finishes, click “Edit Model Functions” and select Party/Charter Fishing. This is where you enter the party/charter production function information shown in Table 3. Before the cost data can be entered, you must match your expenditure category to the appropriate IMPLAN sector. Enter the proportions for each IMPLAN sector in the absorption column. Leave out the value-added proportion because IMPLAN will generate this automatically. After information has been added click on “Balance” and the production function should sum to one. Edits can be made if there is a problem. When done click “Close.” You’re not finished yet! Next, click “Next” and go to “Byproducts.” Check the Party/Charter Fishing sector to see if byproducts exist. Because of the mix of inputs used in the production process, in addition to the primary output product byproducts could result. Examine the byproducts and if they make sense, leave them. If not, zero the byproducts out (remove them) and set the Party/Charter Fishing sector value to 1.0. You’re still not done yet! Will still need to check the production (outputs) of other sectors to see if party/charter fishing is produced as a byproduct. Click on “report,” “social account” and print out the commodity balance sheet for Party/Charter Fishing. The first entry, Industry/Institutional Production will tell you the other producers of Party/Charter Fishing. Most likely, you should edit those byproducts and zero out that production. The last step is to check the production functions of other industries to see if Party/Charter Fishing is used as an input. The Industry Demand Data on the commodity balance sheet will show you who uses Party/Charter Fishing in production. Again, most likely, you will want to zero these out as well. In some cases, you may also want to add entries to other industry production functions for those industries who may use your new sectors output in their production process. I could not think of any sector that would use party/charter fishing as in input. At this point, if you made any changes IMPLAN will reconstruct your study area data to reflect the changes and your new sector has been created. This procedure is described briefly on IMPLAN’s WEB page at <http://www.implan.com>.

At this point, you could also modify any of the margins, deflators, or regional purchase coefficients. It’s a good idea to at least view the values of these items for each of your

expenditure categories to see if they make sense. After that, you're done!

V) Construct the Model and Estimate the Multipliers

If you used the “construct model,” “advanced” feature IMPLAN will have already constructed the model for you and you would've had to specify the type of multipliers you want estimated. If not, you'll need to specify them now. Click on “construct model,” “multipliers,” and then specify the type of multiplier you want estimated. Also make sure the regional purchase coefficient box is checked. The type of multiplier you'll want to use will depend on the circumstance. In this example, type 2 multipliers are appropriate for the nonresidents and type 1 for the residents. Nonresident impacts were estimated from the direct, indirect and induced effects (Type 2) associated with angler expenditures in Maine. In contrast, only the direct and indirect effects (Type 1) were considered for residents to avoid overestimation of impacts because personal consumption expenditures (such as angler expenditures) by Maine residents are already internally incorporated into the estimation of induced impacts. We would be double counting if we used the type 2 multiplier for residents. At this point click on “Go” and IMPLAN will calculate the multipliers. That's it. The multipliers can be printed from the “report” tab.

Be very careful when using the multipliers that are reported withing IMPLAN. While the model's multipliers may be used to assess the impacts of changes on Maine's economy, it is important to understand their limitations. Multipliers are prone to misuse and misinterpretation because they conveniently represent many complex interactions in an economy. To complicate matters further, data limitations often force fishery decision makers to extrapolate multiplier estimates across regions. Few fishery policymakers may realize that multipliers are dependent upon trade flows, production functions and marketing margins which often vary greatly from region to region. In addition, it is not uncommon to confuse the more familiar, albeit increasingly abused, ratio multiplier with the Keynesian multiplier. As Archer (1977) points out, the only appropriate use of ratio multipliers is as a measure of internal linkage among regional economic sectors. Indeed, applied appropriately, they provide decision makers with useful information to relate the direct, indirect and induced impacts to total impacts. Ratio multipliers, nevertheless, are meaningless for predicting total impacts from changes in final expenditures. Although seemingly appropriate, these multipliers are not mathematically linked to final expenditures. Instead, Keynesian multipliers should be used in conjunction with expected changes in final expenditures to determine total economic impacts. Keynesian multipliers are mathematically linked to final expenditures and express the amount of sales, income and employment generated in a region by an additional dollar of spending. Thus, the total impacts of changes in expenditures by party and charter boat anglers in Maine can be estimated by multiplying the appropriate Keynesian multiplier by the change. Caution is advised, however, because Keynesian multiplier projections are based on a region's current industrial structure and assume that there is sufficient productive capacity (i.e., labor and capital) within the region to satisfy an increase in final expenditures.

Extreme caution is advised when ratio or Keynesian multipliers are transferred across regions for the reasons stated above. In fact, when conducting assessments of recreational fisheries along the Northeast coast it is no longer necessary to infer multiplier results across states. The procedures and data sets applied here, if used in conjunction with appropriate versions of IMPLAN, can serve as a foundation for developing economic assessments of

recreational fisheries in other states.

IMPLAN only reports the ratio multiplier, not the Keynesian multiplier. At this point, since we have yet to conduct an impact assessment, we can not calculate the Keynesian multiplier. It would be nice if IMPLAN reported the Keynesian multiplier after we conduct our impact assessment but it can easily be calculated from the results.

VI) Conduct an Impact Assessment

Economic impacts are estimated by applying the IMPLAN multipliers to the five estimated population-level angler fishing expenditures. For this example, impacts were estimated for sales, income and employment. Sales reflects total dollar sales generated from expenditures by party/charter anglers in Maine. Income represents wages, salaries, benefits and profits generated from party/charter angler expenditures. Employment includes both full-time and part-time workers and is expressed as total jobs. Two impact assessments were conducted: one for residents and one for nonresidents. Simply click on “Impacts” and enter the expenditures (Table 2) and associated IMPLAN sectors. The employment values will automatically be calculated from employment per worker ratios calculated by IMPLAN. Choose industry or commodity basis (see manual for further clarification) and the year of your data. IMPLAN deflators are built into the software and should be utilized if adjustments are needed. Choose “yes” under LPC for each IMPLAN sector. This lets IMPLAN know you want to use the regional purchase coefficients calculated by IMPLAN for each sector. After that click “Analyze” and you’ll be prompted to enter an impact name. Enter a name and your impact assessment will be complete within minutes. When complete click on “results” to view your output. Click on the impact name and you’ll see impacts for output, employment, personal income, total value added, employee compensation, proprietors income, other property type income and indirect business taxes. Impacts can be printed by clicking on the “Report” button. Deflators can be used along with the impacts to report impacts in current \$’s. Note: deflators can only be used with the report feature. Deflators can not be used in the view mode.

VII) Summary

If party and charter fishing were to become unavailable in Maine all of the nonresident impacts would likely flow out of the state while the majority of the resident impacts would be redistributed within the economy. Clearly, however, resident expenditures are important because they support specific jobs that would not otherwise exist. Taken as a whole, the nonresident and resident economic impacts presented in this paper provide an indication of the importance of the for-hire marine fishing industry to Maine’s economy.

The frequency with which the I/O model should be modified depends upon the rate of technological change, price variability and the level of fishing activity. In the short-run, technology and prices are likely to change little; however, past annual MRFSS party/charter boat fishing effort estimates in Maine have exhibited variability over time. Thus, the usefulness of the reported impact estimates in near future years is conditional on similar effort estimates.

Perhaps more importantly, though, the model itself could be used in conjunction with updated data to predict the distributional impacts of fishery policies that affect angler expenditures. For example, if a proposed policy decision was expected to reduce out-of-state

participation by 10 percent in 1999, revised effort estimates could easily be incorporated into the model (adjusted for inflation) to predict the impacts on sales, income and employment in Maine.

The IMPLAN system is also updated annually, including its regional databases. Thus, price and technology changes will be incorporated into future versions. In addition, the NMFS has recently committed to collecting detailed expenditure data from marine anglers along the Atlantic coast every 3 years. These data will express changes in tastes and preferences and could be used to update the mix of angler expenditures provided in this study. Efforts are also underway by various researchers along the Atlantic coast to collect fishery dependent cost data necessary for characterizing the actual purchasing behavior of for-hire businesses by state. In combination, these activities provide the ability to continually update the I/O model presented here.

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Table 1.--Average 1996 daily trip-related expenditures^a (dollars) per party and charter participant in Maine, by resident category

Trip-related expenditures	Nonresidents	Residents
Lodging	24.10	0.46
Travel by private auto	9.75	9.86
Passenger fees	41.36	29.85
Groceries	5.10	5.10
Meals	2.39	2.39
Total	82.70	47.66

^a1994 average trip-related expenses were adjusted for inflation to their 1996 equivalent using IMPLAN deflators, derived from the Bureau of Labor Statistics Growth Model.

Table 2.--Total 1996 daily trip-related expenditures^b (dollars) for party and charter participants in Maine, by resident category

Trip-related expenditures	Nonresidents	Residents
Groceries	65,570	28,454
Meals	30,714	13,328
Lodging	313,588	2,544
Travel by private auto	125,301	55,007
Passenger fees	531,520	166,496
Total	1,066,693	265,828

^bValues were calculated from nonrounded numbers and differ slightly from the result of multiplying 1996 MRFSS effort estimates by Table 1 values.

Table 3.--Estimated average 1996 Maine for-hire operator production function and associated IMPLAN sectors

Primary data categories	Percentage of total cost	IMPLAN sector
Loans	31.24	Banking
Office and booking /referrals	11.89	Management and consulting services
Wages and salaries	11.23	Employee compensation
Mooring and dockage	9.33	Water transportation
Insurance	6.42	Insurance carriers
Repairs/improvements	6.13	Boat building and repairing
Fishing equipment and bait	5.66	Sporting and athletic goods
Fuel and oil	5.10	Service stations
Advertising	4.01	Advertising
Telephone	2.93	Communications
Professional fees	1.97	Accounting, auditing, bookkeeping
Taxes and registration	1.19	Federal government non-military
Consumer apparel	1.15	Apparel
Business associations	0.93	Business associations
Food and beverages	0.44	Food stores
Ice	0.38	Manufactured ice

Table 4.--Description of Economic Sectors in Maine Party/Charter IMPLAN Model

SECTOR	IMPLAN SECTOR DESCRIPTION	IMPLAN SECTOR	BEA EQUIVALENT	SIC EQUIVALENT
Lodging	Hotels & Lodging Places	463	72.0100	7000
P/C Fee	Party/Charter	Created	None	None
Eating & Drinking Places	Eating & Drinking	454	74.0000	5800
Food & Drink Purchases	Food Stores, Miscellaneous Retail	450, 455	pt. 69.0200	5400, 5900
Travel Expenditures	Automobile Dealers & Service Stations	451	pt. 69.0200	5500